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Lead in School's Drinking Water

CONTENTS

part 2

SAMPLING PROTOCOL

Suggested Sampling Procedures to Determine the Location and Source of Lead in School Drinking Water

PURPOSE

The importance of testing

Testing is the only sure way of telling whether or not there are harmful amounts of lead in your school's drinking water. As explained earlier, lead has most likely entered your school's drinking water through corrosion of the service connections, pipes, fixtures and other parts of the plumbing system distributing water *within* your buildings - rather than from the water supply itself. The sampling procedures outlined here will help you determine the location and source of the lead in water obtained from specific components of the system, such as water fountains, central chiller units, water coolers, bottled water dispensers, ice making machines, faucets, internal plumbing, and service connections. Give a copy of the protocol to each person who will take the samples or evaluate the findings.

Although the methods outlined in this protocol are similar to the sampling procedures used by water suppliers to determine compliance with the requirements of the Safe Drinking Water Act, **this protocol is not to be used to determine whether a water supplier meets the federal standards.**

This protocol has been field tested and found to provide results which are generally reliable. Despite the fact that lead levels of samples taken at various times from the same sample site may vary, the results are usually similar. Thus, if test results exceed 20 ppb, you can expect lead levels of subsequent samples to warrant remedial action. The opposite is also true.

[Note: ppb is often expressed as micrograms per liter (ug/1). One ppb is equal to one microgram per liter (ug/1) or.001 milligrams per liter

BEFORE YOU BEGIN

Approach the sampling systematically

Analysis of samples should be done by a state-certified laboratory using EPA-approved methods. *(Contact your local water utility or state department of health or environment for information and assistance.)*

To keep the number of samples to a minimum, approach the task systematically:

a. Prior to sampling, study the layout of the plumbing system of your

Understand the plumbing layout of your buildings

building. The configuration of the interior plumbing can vary depending on the layout of the building. *(Examples of various plumbing configurations in buildings are illustrated in the attached diagrams.)* Locate service intakes, headers, laterals, fixture supply pipes, drinking water fountains, central chiller units, storage tanks, riser pipes and different drinking water loops.

In multi-story buildings, the water is elevated to the floors by one or more riser pipes. Water from the riser pipes is usually distributed through several different drinking water loops. In addition, in some buildings, water may be stored in a tank prior to distribution. In single-story buildings, the water comes from the service connection via main plumbing branches, often called headers. These in turn supply water to laterals. Smaller plumbing connections from the laterals and loops supply water to the faucets, drinking fountains, and other outlets.

The terms "upstream" and "downstream" are used frequently in this protocol. For sampling purposes, water within a plumbing system moves "downstream" from the source, i.e. the distribution main in the street.

Identify areas with highest risk of lead contamination

b. Complete the plumbing profile on pages 11 and 12 of this manual. This will enable you to identify areas of highest risk and prioritize your sites accordingly. *(See also the section entitled WHEN TO EXPECT LEAD CONTAMINATION which begins on page 10.)* Sample sites which are most likely to show lead contamination include:

- areas where the plumbing is used to ground electrical circuits;
- areas where corrosive water having low pH and alkalinity is distributed;
- areas of low flow and/or infrequent use (where water is in contact for a long time with sediments or plumbing containing lead);
- areas containing lead pipes or areas of recent construction and repair in which lead solder or materials containing lead were used;
- water coolers identified by EPA as having lead lined storage tanks or other parts containing lead.

If the analyses of these samples indicate contamination of the drinking water by lead, additional sampling from other sites deemed less vulnerable to lead contamination may be indicated.

A TWO-STEP PROCESS

EPA recommends that the sampling program be done in two steps.

Initial screening samples identify location of lead contamination

Step 1:

The purpose of this first step is to **identify the outlets** which provide drinking water showing significant lead levels. In step 1, **screening samples** from drinking water outlets within the building are collected and analyzed.

Step 2:

The purpose of step 2 is to **pinpoint the sources** of lead in the drinking water from outlets which showed significant lead levels in the initial screening samples. In step 2, **follow-up samples** are collected and analyzed from these outlets. If necessary, additional samples from the interior plumbing within the building are taken.

Follow-up samples Identify source of lead contamination

Once the sources of contamination are known, appropriate remedial actions may be taken.

Ultimately, the choice of performing the sampling in one or two steps is up to the personnel performing the sampling. Small facilities with relatively few sites to be sampled may be able to perform all of the sampling at once. (A flow *chart outlining the overall general sampling strategy is attached.)*

The number of samples taken from a building depends upon the size of the building, the number of outlets used to supply drinking water, and the extent of the contamination. More outlets with elevated lead levels will require correspondingly more follow-up samples to pinpoint the sources of contamination. **In general, a larger number of samples will result in the best assessment of the source and extent of lead in drinking water.**

LABORATORY ANALYSIS AND HANDLING OF SAMPLE CONTAINERS

Follow laboratory's instructions exactly

The sample containers should be prepared in a clean laboratory environment by qualified laboratory personnel using the appropriate purity chemicals. Do not attempt to prepare your own sample containers unless your school has qualified personnel and an appropriate facility. The laboratory should provide you with enough sample containers. Follow the instructions provided for handling the sample containers to ensure accurate results. Do not rinse the sample containers before filling. The laboratory has prepared the containers to receive the samples you will take and they may contain a chemical needed to preserve the samples properly until they reach the laboratory. Avoid any contact with this chemical. Be careful not to overfill the sampling containers with water. *(For information about the preparation of sample containers and sample preservation, refer to the Appendix, page 50.)*

Label all of the sample bottles with the location of the sample site. Also note the manufacturer's name and model number of water fountains, water coolers, central chillers, and any other water dispensing outlets from which samples are taken.

General sampling procedures

GENERAL SAMPLING PROCEDURES

(1) Collect all samples before school opens and before any water is used. Ideally, the water should sit in the pipes unused for at least 8 hours but not more than 18 hours before the sample is taken. However, in some areas of infrequent use, water from a particular outlet may not have been used in more than 18 hours. Despite this, the sample would still be representative of the normal water consumption pattern.

(2) Make sure that no water is withdrawn from the taps or fountains from which the samples are to be collected prior to sampling. Samples collected from the designated sites after they have been used will indicate lower lead levels than may be actually

(3) Unless specifically directed to do so, do not collect samples in the morning after vacations, week-ends or holidays. These samples will contain higher lead levels than those collected at other times and are not representative of normal water consumption patterns. Finding the source of any lead contamination through follow-up samples would thus be more difficult. *(For more details, see pages 18 and 19.)*

HOW TO BEGIN

First, contact your water supplier. Under the proposed regulations *(see page 4),* water delivered by a public water supplier would be required to have lead levels equal to or less than 5 ppb when it leaves the treatment plant. If the lead level of the water exceeds 5 ppb, your water supplier would be required to bring the lead concentration down. If your school supplies its own water, the school is considered a public water supplier and is subject to the provisions of this law. *(See the section entitled THE SAFE DRINKING WATER ACT, page 4.)*

If your supplier verifies that the drinking water leaving the treatment plant has lead levels of 5 ppb or less, take a sample of the water coming into your building. If the lead level exceeds 20 ppb, the problem may be a lead service connector or the distribution main. (The service connection is the plumbing connection between the distribution main in the street and the plumbing in the building.) If the test result is low (5 ppb or less), any problem will be from the interior plumbing of your building.

SAMPLING SERVICE CONNECTIONS

Until recently in some locations, lead pipes up to 2 1/2 inches in diameter were used for service connectors. Other materials used for service connectors include copper, galvanized steel, plastic, and iron. Lead service connectors can produce significant lead levels in your drinking water.

EPA recommends using the tap **closest to the service connector** for sampling. This is especially important in larger facilities where more than one service connection is present.

Sample IS

Sampling service connections

Take this sample before school opens. Open the tap closest to the service connection. Let the water run and feel the temperature of the water. As soon as you feel the water change from warm to cold, collect the sample. Because water warms slightly after standing in the interior plumbing, this colder water sample represents the water that had been standing just outside of the building and in contact with the service connector. Fill the sample container with 250 mL of water unless otherwise directed by the laboratory.

The distribution main rarely causes lead contamination

Sample IM

This sample is representative of the water that has been standing in the distribution main. Take it from the same location as sample 1S. Let the water run and feel the temperature of the water. When you feel the water change from warm to cold, allow the water to run for an additional 3 minutes and then collect the sample. Fill the sample container with 250 mL of water.

Interpreting the Results

• **If the lead level of sample 1S significantly exceed 5 ppb (for example 10 ppb) and is higher than in sample 1M,** lead is contributed from the service connector. Check for the presence of a lead service line. In the absence of a lead service connector, lead goosenecks or other appurtenances containing lead in line with the service connection may be the source of contamination. Usually no significant amount of lead (above 5 ppb) comes from the distribution main.

• **If the lead level of sample 1M significantly exceeds 5 ppb (for example 10 ppb),** lead in the water may be attributed to the source water, sediments in the main, or possibly from lead joints used in the installation or repair of cast iron pipes. If the water supplied is from a well, a lead packer in the well may also contribute lead to the water.

• **If the lead level of samples 1S and 1M are very low, close to 5 ppb,** very little lead is picked up from the service line or the distribution main. If any of the initial screening samples of Step 1 indicate a problem with lead contamination, the source of that contamination is in the interior plumbing and/or outlets (or sediments containing lead which are trapped in the plumbing or on screens), not the water supply or the service connection.

STEP 1 - TAKING INITIAL SCREENING SAMPLES

SAMPLING INDIVIDUAL OUTLETS

Identifying the location of drinking water outlets with lead contamination

Next collect **initial screening samples** for analysis from individual outlets in areas you have identified as having a high risk of contamination. These outlets include drinking water fountains (including water coolers), ice making machines, water faucets and any place where sediment has collected in the plumbing or on screens.

DRINKING WATER FOUNTAINS

Drinking water fountains

There are four main types of drinking water fountain systems:

1. The **Bubbler** or **Drinking Fountain.** Water is supplied to the bubbler or fountain directly from the building's plumbing.

2. A **Central Chiller Unit** cools water for a number of drinking fountains or bubblers in the building.

3. A **Water Cooler** is equipped with its own cooling and storage system. Water is supplied to the water cooler from the building's plumbing.

4. A **Bottled Water Dispenser** is a type of water fountain whose water is supplied from bottled water.

Note: Do not close the valves to the water fountains to prevent their use. Minute amounts of scrapings from the valves will produce inaccurate results showing higher than actual lead levels in the water. Take all samples with the taps fully open.

Bubblers without central chiller

BUBBLERS OR DRINKING FOUNTAINS

Bubblers without Central Chiller

Fill sample containers with 250 mL of water.

Initial Screening Sample Number 1A

This sample is representative of the water that may be consumed at the beginning of the day or after infrequent use. It consists of water that has been in contact with the bubbler valve and fittings and the section of plumbing closest to the **outlet** of the unit.

Take this sample before school opens and before any water is used. Collect the water immediately after opening the faucet without allowing any water to run into the sink. Follow up samples should be taken from those water fountains where test results indicate lead levels over 20 ppb.

Bubblers with Central Chiller

Bubblers with central chiller

Fill sample containers with 250 mL of water.

Initial Screening Sample Number 1B

This sample is representative of the water that is consumed at the beginning of the day or after infrequent use. It consists of water that has been in contact with the bubbler valve, the fittings, and the section of plumbing closest to the **outlet** of the unit.

Take this sample before school opens and before any water is used. Collect the water immediately after opening the faucet without allowing any water to run into the sink. Follow up samples should be taken from those water fountains where test results indicate lead levels over 20 ppb.

Water coolers

WATER COOLERS

The two types of water coolers used are the wall mounted and the free standing. Water in the cooler is stored in a pipe coil or in a reservoir. Refrigerant coils in contact with either of these storage units cool the water. Sources of lead in the water may be: the internal components of the cooler, including a lead-lined storage unit; the section of the pipe connecting the cooler to the lateral; and/or the interior plumbing.

The Lead Contamination Control Act of 1988 contains specific requirements for the testing, recall, repair and/or replacement of water coolers containing lead. Contact your state department of health or environment to see if the manufacturer and model number of your unit(s) is on the list of water coolers identified by EPA as containing lead. *(Refer to pages 4 and 15 of this manual for additional information.)*

Fill all sample containers with 250 mL of water.

Initial Screening Sample Number 1C

This sample is representative of the water that may be consumed at the beginning of the day or after infrequent use. (Although in some areas of infrequent use the water may not have been used in more than 18 hours, the sample is still representative of the normal water consumption pattern.) It consists of water that has been in contact with the valve and fittings, the storage unit, and the section of plumbing closest to the **outlet** of the unit.

Take this sample before school opens and before any water is used. Collect the water immediately after opening the faucet without allowing any water to waste. Follow-up samples should be taken from those water coolers where test results indicate lead levels over 20 ppb.

Bottled water dispensers

BOTTLED WATER DISPENSERS

Fill all sample containers with 250 mL of water.

Initial Screening Sample Number 1D

This sample is representative of the water that may be consumed at the

beginning of the day or after infrequent use. It consists of water that has been in contact with the dispenser valve and fittings incorporated in the outlet of the unit.

Take this sample before school opens and before any water is used. Collect the water immediately after opening the faucet without allowing any water to waste. Follow-up samples should be taken from those bottled water dispensers where test results indicate lead levels over 20 ppb.

Ice Making Machines

ICE MAKING MACHINES

Initial Screening Sample Number 1E

Fill a suitable container (250 mL or larger, wide-mouthed bottle or Whirl-Pak TM) prepared by the laboratory at least three quarters full of ice. Do not touch the ice with your hands. Use the non-metal scoop or disposable plastic gloves provided by the lab.

If lead levels in the samples taken from the ice-making machine exceed 20 ppb, take follow-up sample number 2E to determine if the source of the lead is the plumbing or the ice-making machine itself.

Water faucets

WATER FAUCETS

Fill all sample containers with 250 mL of water.

Initial Screening Sample Number 1F

This sample is representative of the water that may be consumed at the beginning of the day or after infrequent use. It consists of water that has been in contact with the fixture and the plumbing connecting the faucet to the lateral.

Take this sample before school opens and before any water is used. Collect the water immediately after opening the faucet without allowing any water to run into the sink. Follow-up samples should be taken from those water faucets where test results indicate lead levels over 20 ppb.

STEP 2 - TAKING FOLLOW-UP SAMPLES

Take follow-up samples from all drinking water outlets where test results indicate lead levels over 20 ppb. If the results of the initial screening samples indicate extensive contamination of the drinking water by lead, you should take additional samples from other sites not previously tested. EPA recommends that any drinking water fountain or tap with lead levels over 20 ppb be taken out of service immediately until the lead levels are reduced to below 20 ppb.

Refer to page 30 for general sampling procedures to be followed when taking follow-up samples.

BUBBLERS OR DRINKING FOUNTAINS

Bubblers without Central Chiller

Take follow-up samples from those water fountains where initial sample test results indicate lead levels above 20 ppb. Fill all sample containers with 250 mL of water.

Bubbler without central chiller

Follow-up Sample Number 2A

This sample is representative of the water that is in the plumbing upstream from the bubbler. Take this sample before school opens and before any water is used. Let the water from the fountain run for 30 seconds before collecting the sample.

Interpreting the Results

To determine the **source** of lead in the water, compare the test results of samples lA and 2A.

• **If the lead level in sample 1A is higher than in sample 2A,** a portion of lead in the drinking water is contributed from the bubbler.

• **If the lead level in sample 2A is very low, close to 5 ppb,** very little lead is picked up from the plumbing upstream from the outlet. The majority or all of the lead in the water is contributed from the bubbler.

Bubbler without central chiller (continued)

• **If the lead level in sample 2A significantly exceeds 5 ppb** (for example, 10 ppb), lead in the drinking water is also contributed from the plumbing upstream from the bubbler**.**

• **If the lead level in sample 2A exceeds 20 ppb,** EPA recommends sampling from the header or loop supplying water to the lateral to locate the source of the contamination. *(Refer to the section entitled INTERIOR PLUMBING on page 45.)*

Bubbler with Central Chiller

Bubbler with central chiller

Take follow up samples from those water fountains where initial screening sample test results indicate lead levels over 20 ppb. Fill all sample containers with 250 mL of water.

Follow-up Sample Number 2B

This sample is representative of the water that is in the plumbing upstream from the bubbler. Take this sample before school opens and before any water is used. Let the water from the fountain run for 30 seconds before collecting the sample.

Interpreting the Results

To determine the **source** of lead in the water, compare the test results of samples 1B and 2B.

• **If the lead level in sample 1B is higher than in sample 2B**, a portion of lead in the drinking water is contributed from the bubbler.

• **If the lead level in sample 2B is very low, close to 5 ppb,** very little lead is picked up from the plumbing upstream from the outlet. The majority or all of the lead in the water is contributed from the bubbler.

• **If the lead level in sample 2B significantly exceeds 5 ppb,** (for example, 10 ppb), the lead in the drinking water may be contributed from the plumbing

supplying the water from the chiller to the bubbler, from the chiller, or from the plumbing supplying water to the chiller.

• **If the lead level in sample 2B exceeds 20 ppb,** EPA recommends sampling from the chiller unit supplying water to the lateral to locate the source of the contamination *(see procedures for samples 3B and 4B from central chiller unit).*

Central chiller unit

CENTRAL CHILLER UNIT

Fill all sample containers with 250 mL of

Follow-up Sample Number 3B

This sample is representative of water that has been in contact with the plumbing supplying water to the chiller. Take this sample before school opens and before any water is used. Take the sample from a tap or valve as close to the inlet of the chiller as possible. Collect the water immediately after opening the tap or valve, without allowing any water to waste.

Follow-up Sample Number 4B

This water sample consists of water that has been in contact with the chiller unit. and the plumbing upstream-which supplies water to the chiller. Often, water supplied to the bubblers is recirculated to the chiller unit. In this instance, sample 4B consists of a mixture of water from the water supply and recirculated water from the plumbing supplying water to the bubblers.

Take the sample from a tap or valve as close to the **outlet** of the chiller as possible. Collect the water immediately after opening the tap or valve, without allowing any water to waste.

Interpreting the Results

• **If the lead level in sample 2B is higher than in sample 4B,** lead is contributed from the plumbing supplying the water from the chiller to the water fountain.

Central chiller unit (continued)

- **If the lead level in sample 4B is greater than in sample 3B,** a portion of the lead may be coming from the chiller. Note: sludge and sediments containing high levels of lead may accumulate in chiller tanks. If the test results indicate that lead is contributed from the chiller unit, check for the presence of debris and sludge. Remove any of these materials from the chiller, flush the chiller unit, and re-sample the water.

If the lead level in sample 3B exceeds 20 ppb, EPA recommends additional sampling from the distribution system supplying water to the chiller to locate the source of contamination. *(Refer to the section entitled INTERIOR PLUMBING on page 45.)*

- **If the lead level in sample 3B is very low, close to 5 ppb,** very little lead is picked up from the plumbing upstream from the chiller. The majority or all of the lead in the water may be attributed to the chiller and the plumbing downstream from the chiller.

Water coolers

WATER COOLERS

Follow-up samples are taken from those water coolers where test results indicate lead levels over 20 ppb. Fill all sample containers with 250 mL of water. These samples will help you determine what the source of contamination is. Be aware that:

- Some water coolers have storage tanks lined with materials containing lead. You should contact the manufacturer of any water cooler units you have purchased, or are planning to purchase, for written guarantees that no lead has been used in the unit. A list of brands and model numbers of coolers which contain lead has been prepared by EPA and is available from your state department of health or environment. *(Refer to page 4 for additional information.)*

- Sediments and debris containing lead on screens or in the plumbing frequently produce significant lead levels (*Follow-up Sample 4C).*

- Lead solder in the plumbing can also contribute to the problem.

Water coolers
(continued)

Follow-up Sample Number 2 C

This water sample is representative of the water that is in contact with the plumbing upstream of the cooler. Take this sample after school closes. Let the water from the fountain run for 15 minutes before collecting the sample. **You must flush for 15 minutes to ensure that no stagnant water is left in the storage unit.**

Follow-up Sample Number 3C

Because the water in the cooler was flushed the previous afternoon, this sample is representative of the water that was in contact with the cooler overnight, not in extended contact with the plumbing upstream. (In this, it may differ from Initial Screening Sample 1C.)

Take this sample before school opens and before any water is used. **This sample must be taken the morning after you collect sample 2C.** Collect the water immediately after opening the faucet without allowing any water to waste.

Interpreting the Results

• **If the lead level in sample 3C is higher than in sample 2C,** the water cooler is contributing lead to the water.

• **If the lead level in sample 3C is higher than in sample 2C AND the lead level in sample 1C is higher than in sample 3C,** the plumbing upstream from the water cooler may also be contributing lead to the water.

• **If the lead level in sample 3C is identical or close to that of sample 2C,** the water cooler probably is not contributing lead to the water.

• **If the lead level in sample 1C is higher than in sample 3C, AND if the lead levels in sample 2C and 3C are close or identical,** the plumbing upstream from the cooler and/or the plumbing connection leading to the cooler, or both, are contributing lead to the water.

• **If the lead level in sample 2C is in excess of 10 ppb and is equal to or greater than the lead levels in samples 1C and 3C,** the source of the lead may be sediments contained in the cooler storage tank, screens, or the plumbing upstream from the cooler.

Water coolers
(continued)

To verify the source of lead, take the following steps.

1. Take a 30 second flushed sample from a tap upstream from the cooler or compare sample 2C with the results obtained from follow-up samples taken from outlets upstream from the cooler. If low lead levels are found in these samples (close to 5 ppb), the source of lead may be sediments in the cooler or the plumbing connecting the cooler to the lateral, or lead solder in the plumbing between the taps.
2. If the flushed samples from the upstream outlets have lead levels in excess of 5 ppb, then the cooler and the upstream plumbing may both contribute lead to the water.

To confirm whether the cooler is a source of lead, take and analyze sample 4C.

Follow-up Sample Number 4C

Turn off the valve leading to the cooler. Disconnect the cooler from the plumbing and look for a screen at the **inlet**. Remove the screen. If there is debris present, check for the presence of lead solder by sending a sample of the debris to the laboratory for analysis.

Some coolers also have a screen installed at their bubbler **outlet**. Carefully remove the bubbler outlet by unscrewing it. Check for a screen and debris, and have a sample of any debris analyzed.

Some coolers are equipped with a drain valve at the **bottom of the water reservoir.** Water from the bottom of the water reservoir should be sampled and any debris analyzed.

Collect sample 4C from the disconnected plumbing outlet in the same manner as you collected sample number 1 C. Compare the results from sample 4C to those of the other samples.

Interpreting the Results

- **If the lead level in sample 4C is less than 5 ppb,** then lead is coming from the debris in the cooler or the screen.

- **If the lead level in sample 4C is significantly higher than 5 ppb,** the source of lead is the plumbing upstream from the cooler.

BOTTLED WATER

Get written assurance of lead levels from bottled water distributor

Fill all sample containers with 250 mL of

Follow-up Sample Number 2D

Collect this sample directly from the bottle which supplies the water to the unit. This will enable you to determine the **source** of lead in the water.

Interpreting the Results

• **If the lead level in sample 1D is higher than in sample 2D,** lead may be coming from the dispenser unit.

• **If the lead level in sample 2D is identical or close to sample 1D),** the source of lead is the bottled water.

Note: The proposed regulations limit the amount of lead in source waters to 5 ppb. The Food and Drug Administration, which regulates the interstate sale of bottled water is expected to adopt similar regulations. EPA recommends that you do not drink bottled water containing lead levels over 5 ppb and that you contact your distributor for written assurance that the bottled water does not exceed this level.

ICE MAKING MACHINES

Ice making machines

If the lead level in the sample taken from the ice-making machine exceeds 20 ppb, take follow-up sample number 2E to determine if the source of the lead is the plumbing or the ice making machine itself.

Follow-up Sample Number 2E

Disconnect the icemaker from the plumbing and look for a screen at the inlet. Remove the screen. If debris is present, forward a sample of the debris to the laboratory for analysis. The laboratory will determine if lead solder is present. **If the debris contains lead, the screen should be cleaned frequently as a regular routine.**

Collect the sample from the disconnected plumbing as close to the ice maker as possible. Fill the sample container with 250 mL of water.

Ice making machines (continued)

Interpreting the Results

• **If the lead level in sample 2E is close to 5 ppb,** the source of the lead in the ice is the ice maker.

• **If the lead level in sample 2E significantly exceeds 5 ppb,** (for example, 10 ppb), lead is also contributed from the plumbing upstream from the ice maker.

• **If the lead level in sample 2E exceeds 20 ppb,** EPA recommends sampling from the distribution system supplying water to the ice maker. *(Refer to the section entitled INTERIOR PLUMBING on page 45.)*

WATER FAUCETS

Fill all sample containers with 250 mL of water.

Water faucets

Follow-up Sample Number 2F

This sample is representative of the water that is in the plumbing upstream from the faucet. Take this sample before school opens and before any water is used. Let the water from the faucet run for 30 seconds before collecting the sample.

Interpreting the Results

• **If the lead level in sample 1F is higher than in sample 2F,** the source of lead is the water faucet and/or the plumbing upstream from the faucet.

• **If the lead level in sample 2F is very low, close to 5 ppb,** very little lead is coming from the plumbing upstream from the faucet. The majority or all of the lead in the water is from the faucet and/or the plumbing connecting the faucet to the lateral.

• **If the lead level in sample 2F significantly exceeds 5 ppb,** (for example, 10 ppb), lead may be contributed from the plumbing upstream from the faucet.

SAMPLING INTERIOR PLUMBING

In general, if lead levels exceed 20 ppb in follow-up samples taken from the drinking water outlets, additional samples from designated sample sites in the interior plumbing should be taken. These sites include the laterals, loops and/or headers, and riser pipes. The configuration of the interior plumbing will vary depending on the layout of the building. *(For illustration, refer to the attached diagrams.)*

The sampling should proceed systematically upstream from the initial follow-up sample sites. The goal is to isolate those sections of the interior plumbing which contribute lead to the water by comparing the results of these samples with results of previous samples.

Fill all sample containers with 250 mL of

LATERALS:

Laterals

Laterals are the plumbing branches between a fixture or group of fixtures, such as taps, water fountains, etc.

Sample lG

Open the tap that has been designated as the sample site for the lateral pipe. Let the water run for 30 seconds before collecting the sample. The purpose of flushing the water is to clear the plumbing between the sample site and the lateral pipe which will assure collection of a representative sample.

Note: Sample 1G corresponds to follow-up samples taken from other outlets such as 2A, 2E, and 2F. Compare the results of these samples from outlets upstream and downstream of sample 1G for additional information on the source of the lead within the interior plumbing.

Interpreting the Results

• **If the lead level in sample 1G exceeds 20 ppb,** collect additional samples from the plumbing upstream (the service line, the riser pipe, the loop or header supplying water to the lateral).

Laterals (continued)

Note: High lead levels may also be caused by recent repairs and additions using lead solders, or by sediments and debris in the pipe. Debris in the plumbing is most often found in areas of infrequent use and a sample should be sent to the laboratory for analysis.

• **If the lead level of sample 1G is the same as the lead level in a sample taken downstream from sample site 1G,** lead is contributed from the lateral or from interior plumbing upstream from the lateral. Possible sources of lead may be the loop, header, riser pipe, or service connection.

• **If the lead level in sample 1G is very low, close to 5 ppb,** the portion of the lateral upstream from sample site 1G and the interior plumbing supplying water to the lateral are not contributing lead to the water.

• **If the lead level in sample 1G significantly exceeds 5 ppb (for example, 10 ppb), and is less than the lead level in a sample taken downstream from sample site 1G,** a portion of the lead is contributed downstream from the sample site.

LOOPS AND/OR HEADERS

Loops and headers

A loop is a closed circuit of a plumbing branch which supplies water from the riser to a fixture or a group of fixtures. A header is the main pipe in the internal plumbing system of a building. The header supplies water to lateral pipes.

EPA recommends that water samples from each loop and/or header be collected because use patterns may vary among locations within a building. Construction materials may also vary among loops, especially in larger schools where additions and repairs have been made to the original structure.

Sample number 1H (header) or 1I (loop)

Locate the sampling point furthest from the service connection or riser pipe on a floor. Open the faucet and let it run for 30 seconds before collecting this sample. The purpose of flushing the water is to clear the faucet and plumbing between the sample site and the loop and/or header pipe, thus assuring collection of a representative sample.

Loops and headers (continued)

Interpretation of Results

• **If the lead level is over 20 ppb,** collect additional samples from the plumbing upstream supplying water to the loop or header. Compare the sample results with those taken from the service line or the riser pipe which supplies water to the loop and/or header.

High lead levels may also be caused by recent repairs and additions using lead solders, or by sediment and debris in the pipe. Debris in the plumbing is most often found in areas of infrequent use and a sample should be sent to the lab for analysis.

• **If the lead level in sample 1H or 1I is equal to the lead level in a sample taken downstream from sample site 1H or 1I,** the lead is contributed from the header or the loop and from the interior plumbing upstream from the head or loop. Possible sources of lead may be the loop, header, riser pipe, or service connection.

• **If the lead level in sample 1H or 1I is close or equal to 5 ppb,** the portion of the header or loop upstream from sample site 1H or 1I and the interior plumbing supplying water to the loop or header are not contributing lead to the drinking water. The source of lead is downstream from the sample site.

• **If the lead level in sample 1H or 1I significantly exceeds 5 ppb (for example 10 ppb), and is less than the lead level in a sample taken downstream from sample site 1H or 1I,** a portion of the lead is contributed downstream of the sample site.

Riser Pipe

RISER PIPES

A riser is the vertical pipe that carries the water from one floor to another. Fill all sample containers with 250 mL of water.

Sample Number 1J

Open the tap closest to the riser pipe. Let the water run for 30 seconds before collecting the sample. The purpose of flushing the water is to clear the

Riser pipes
(continued)

faucet and plumbing between the sample site and the riser pipe which will assure collection of a representative sample.

Interpreting the Results

• **If lead levels exceed 20 ppb**, collect additional samples from the plumbing upstream from the riser. High lead levels in the riser pipes may also be caused by recent repairs and additions using lead solder.

• **If the lead level in sample 1J equals the lead level in a sample taken downstream from sample site 1J,** the source of the lead is the riser pipe or the plumbing and service connection upstream from the riser pipe.

• **If the lead level in sample 1J is close or equal to 5 ppb,** the portion of the riser pipe and plumbing upstream from sample site 1J and the service connection are not contributing lead to the water. The source of the lead is downstream of the sample site.

• **If the lead level in sample 1J significantly exceeds 5 ppb (for example, 10 ppb) and is less than the lead level in a sample taken downstream from sample site 1J,** a portion of the lead is contributed downstream of the sample site.

GLOSSARY

Bubbler: A water fountain fixture connected to the water supply. A bubbler does not contain a refrigeration unit.

Chiller: A central refrigeration unit providing cold water to bubblers.

Corrosion: A dissolving and wearing away of metal caused by a chemical reaction (in this case, between water and the piping that the water contacts).

Flux: A substance applied during soldering to facilitate the flow of solder. Flux often contains lead and can itself be a source of lead contamination in water.

Header: The main pipe in the internal plumbing system of a building. The header supplies water to lateral pipes.

Lateral: A plumbing branch between a fixture or group of fixtures (taps, water fountains, etc.) and the header.

Loop: A closed circuit of a plumbing branch which supplies water from the riser to a fixture or a group of fixtures.

Public Water System: Any system that supplies water to 25 or more people or has 15 or more service connections (buildings or customers).

Riser: The vertical pipe that carries the water from one floor to

Service Connector: The pipe that carries tap water from the public water main to a building. In the past, these were often made of lead.

Solder: A metallic compound used to seal the joints between pipes. Until recently, most solder contained about 50 percent lead. Lead-free solders often contain one or more of the following metals: antimony, tin, copper, or silver. Several alloys are available that melt and flow in a manner similar to lead solder.

Water cooler: Any mechanical device affixed to drinking water supply plumbing which actively cools water for human consumption. The reservoir can consist of a small tank or a pipe coil.

PRESERVATION OF SAMPLES AND SAMPLE CONTAINERS

Contamination of sample containers by dust, dirt, or other impurities containing lead can produce inaccurate test results in an otherwise conscientious sampling program. Contamination of a water sample by the container may indicate higher lead levels than are actually present in the drinking water.

Another source of error that may affect the result of analysis is the adsorption of lead from the water onto the surface of the container, which will reduce the amount of lead in the water sample. In such instances, analytical results will indicate lower lead levels in the sample than actually are present.

In order to avoid analytical errors, pay particular attention to proper collection and handling of the sample before analysis. Preparation of sample containers is described in detail in an EPA manual entitled, "Methods for Chemical Analysis of Water and Wastes." In brief, the sample container, whether borosilicate glass, polyethylene, polyproplyene, or Teflon should be thoroughly washed with detergent and tap water, rinsed with 1:1 nitric acid and tap water, 1:1 hydrochloric acid and tap water, and finally deionized distilled water - in that order.

Make sure that the containers are kept sealed between the time of their preparation and the collection of the sample. This will assure that no contaminants from the outside are introduced. In order to avoid the loss of lead from the sample through adsorption onto the sample container wall, acidify the sample with concentrated nitric acid to a pH of less than 2. If the nitric acid cannot be used at the time of the collection of the sample because of shipping restrictions, preserve the sample by icing, and ship it immediately to the laboratory. Upon receipt, the laboratory must acidify the sample with concentrated nitric acid to a pH of less than 2.

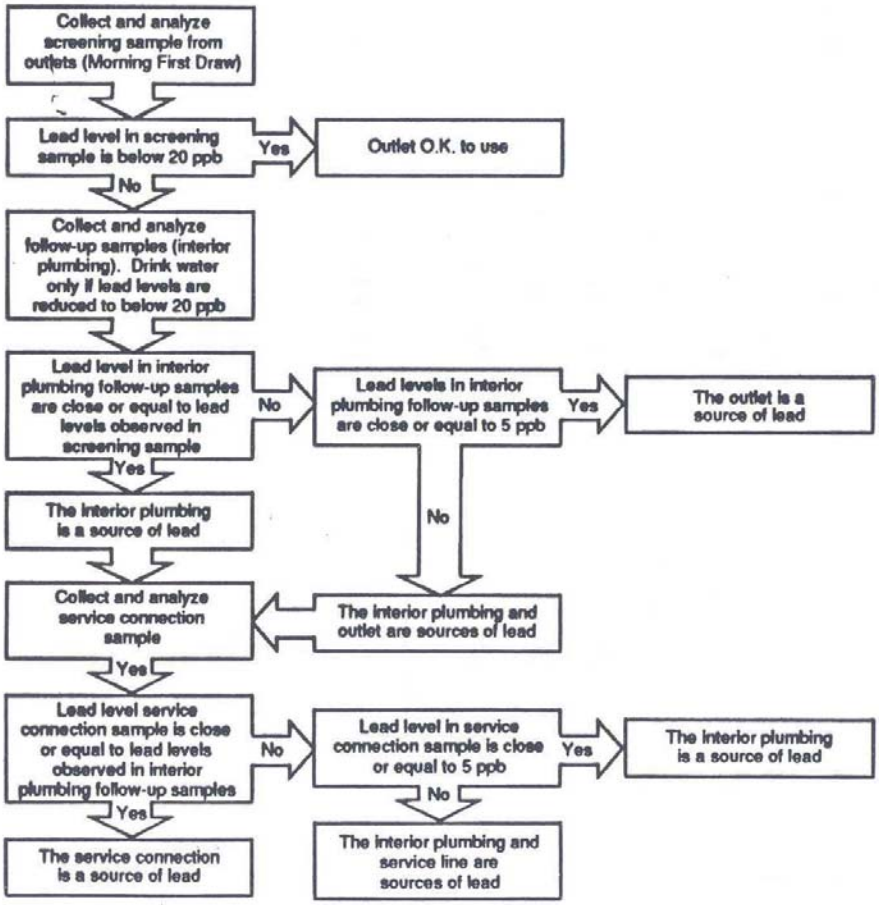
For more detail, refer to EPA manuals entitled

"Methods for Chemical Analysis of Water and Wastes," EPA- 600/4-79-020, March, 1979 (available from U.S. EPA, R & D Publications, 26 W. Martin Luther King, Cincinnati, OH 45268) and

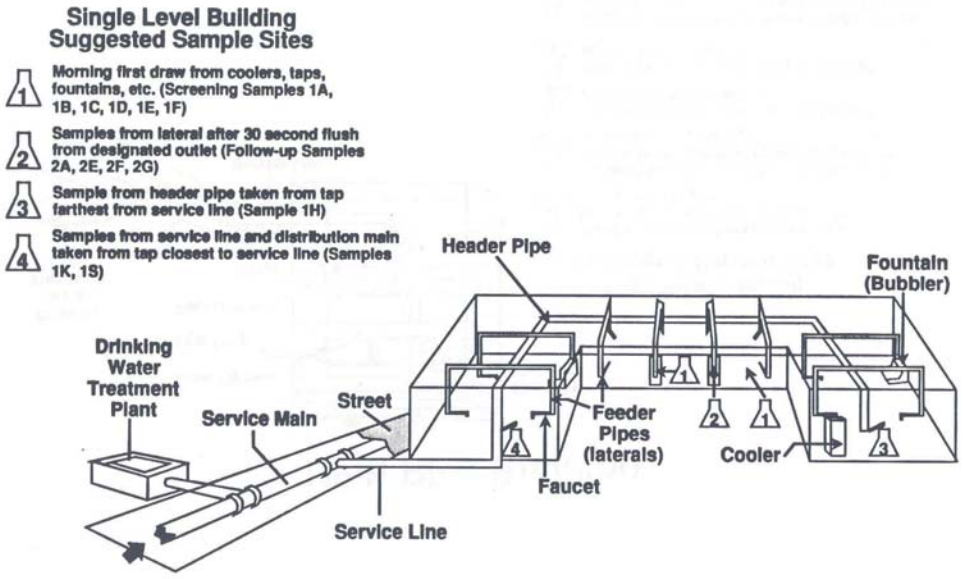
"Manual for the Certification of Laboratories Analyzing Drinking Water," EPA-570/9-82-002, October, 1982 (available from U.S. EPA, Drinking Water Hotline, 800-426-4791).

Initial Screening Sample	Follow-Up Sample(s)	Type of Outlet or Plumbing
1S	1M	Service Connection to Distribution Main
1A	2A	Bubbler without Central Chiller
1B	2B	Bubbler with Central Chiller
	3B, 4B	Central Chiller Unit
1C	2C, 3C, 4C	Water Cooler
1D	2D	Bottled Water Dispenser
1E	2E	Ice Making Machine
1F	2F	Water Faucet
		INTERIOR PLUMBING
	1G	Lateral
	1H	Header
	1I	Loop
	1J	Riser

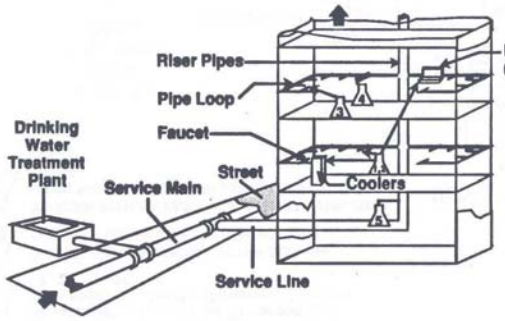
Overall Sampling Strategy



Single-Level Building



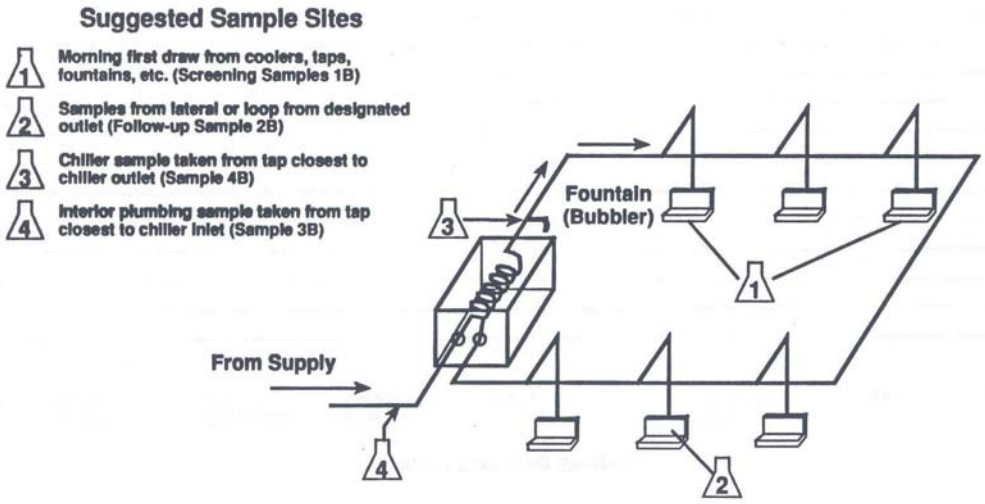
High Rise Building



High Rise Building
Suggested Sample Sites

1. Morning first draw from coolers, taps, fountains, etc. (Screening Samples 1A, 1B, 1C, 1D, 1E, 1F)
2. Samples from lateral or loop - tap after a 30 second flush from designated outlet (Follow-up Samples 2A, 2E, 2F, 2G)
3. Sample from loop taken from tap farthest from riser pipe (Sample 1I)
4. Riser pipe sample taken from tap closest to riser pipe (Sample 1J)
5. Samples from service line and distribution main taken from tap closest to service line (Samples 1K, 1S)

Water Supply to Water Fountain and Bubblers from Central Chiller



Record of Sampling

Name of Building_____

Contact Person for this report_____

Initial Screening Samples

Sample #	Type of Outlet	Mfg/Model Serial #	Date Installed	Location	Date Collected	Time:	Lead ppb